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# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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# Typical Report Citation and Abstract

- ❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

## Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

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# AEROSPACE MEDICINE AND BIOLOGY

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*A Continuing Bibliography (Suppl. 472)*

AUGUST 24, 1998

## 51

### LIFE SCIENCES (GENERAL)

**19980202298** Interstate Commission on the Potomac River Basin, Rockville, MD USA

**Comprehensive List of Chesapeake Bay Basin Species, 1998**

Jun. 1998; 112p; In English

Report No.(s): PB98-141476; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The report provides a list of aquatic and aquatic-associated organisms found in recent decades in the Chesapeake Bay Basin. The list is NOT exhaustive because (1) it is based primarily on taxa identified in monitor programs and not all aquatic taxonomic groups are monitored in the basin, and (2) the focus has been on taxa found in tidal waters. The list is updated annually with new species identified in the ongoing Chesapeake Bay Program biological monitoring programs.

NTIS

*Chesapeake Bay (US); Organisms; Biological Diversity; Marine Biology; Marine Environments*

**19980202342** Ludwig-Maximilians-Univ., Inst. of Zoology, Munich, Germany

**Amino Acid Racemization and the Preservation of Ancient DNA**

Poinar, Hendrik N., Ludwig-Maximilians-Univ., Germany; Hoss, Matthias, Ludwig-Maximilians-Univ., Germany; Science; May 10, 1996; Volume 272, pp. 864-866; In English

Contract(s)/Grant(s): NAGw-2881

Report No.(s): NASA/CR-96-207584; NAS 1.26:207584; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

The extent of racemization of aspartic acid, alanine, and leucine provides criteria for assessing whether ancient tissue samples contain endogenous DNA. In samples in which the D/L ratio of aspartic acid exceeds 0.08, ancient DNA sequences could not be retrieved. Paleontological finds from which DNA sequences purportedly millions of years old have been reported show extensive racemization, and the amino acids present are mainly contaminants. An exception is the amino acids in some insects preserved in amber.

Author

*Amino Acids; Deoxyribonucleic Acid; Aspartic Acid*

**19980202396** Scripps Research Inst., La Jolla, CA USA

**Template-Directed Ligation of Peptides to Oligonucleotides**

Bruick, Richard K., Scripps Research Inst., USA; Dawson, Philip E., Scripps Research Inst., USA; Kent, Stephen BH, Scripps Research Inst., USA; Usman, Nassim, Ribozyme Pharmaceuticals, Inc., USA; Joyce, Gerald F., Scripps Research Inst., USA; Chemistry and Biology; 1996; Volume 3, No. 1, pp. 49-54; In English

Contract(s)/Grant(s): GM-48870

Report No.(s): NASA/CR-96-207596; NAS 1.26:207596; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Synthetic oligonucleotides and peptides have enjoyed a wide range of applications in both biology and chemistry. As a consequence, oligonucleotide-peptide conjugates have received considerable attention, most notably in the development of antisense constructs with improved pharmacological properties. In addition, oligonucleotide-peptide conjugates have been used as molecular tags, in the assembly of supramolecular arrays and in the construction of encoded combinatorial libraries. To make these chimeric molecules more accessible for a broad range of investigations, we sought to develop a facile method for joining fully deprotected oligonucleotides and peptides through a stable amide bond linkage. Furthermore, we wished to make this ligation

reaction addressable, enabling one to direct the ligation of specific oligonucleotide and peptide components. To confer specificity and accelerate the rate of the reaction, the ligation process was designed to be dependent on the presence of a complementary oligonucleotide template.

Author

*Combinatorial Analysis; Conjugates; Pharmacology; Reaction Kinetics; Peptides*

**19980202705** Cold Spring Harbor Lab., New York, NY USA

**Microbial Pathogenesis and Host Defense Final Report, 27 Aug. - 31 Dec. 1997**

Grodzicker, Terri, I, Cold Spring Harbor Lab., USA; Mar. 1998; 282p; In English

Contract(s)/Grant(s): DAMD17-97-1-7352

Report No.(s): AD-A341274; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Understanding microbial pathogenesis demands a detailed knowledge of the host response as well as the pathogen itself, and requires an interdisciplinary approach, integrating the fields of microbiology, eukaryotic cell biology, and immunology. The first Cold Spring Harbor meeting on Microbial Pathogenesis and Host Response was planned to facilitate such interactions, and the meeting attracted over 300 international scientists who approach the study of bacterial and fungal pathogens from a broad range of perspectives.

DTIC

*Microbiology; Pathogenesis*

**19980203205** Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

**Lignin Formation and the Effects of Gravity: A New Approach Progress Report, Jun. 1995 - Mar. 1997**

Lewis, Norman G., Virginia Polytechnic Inst. and State Univ., USA; 1997; 23p; In English

Contract(s)/Grant(s): NAG1-00164

Report No.(s): NASA/CR-97-207817; NAS 1.26:207817; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two aspects of considerable importance in the enigmatic processes associated with lignification have made excellent progress. The first is that, even in a microgravity environment, compression wood formation, and hence altered lignin deposition, can be induced upon mechanically bending the stems of woody gymnosperms. It now needs to be established if an organism reorientating its woody stem tissue will generate this tissue in microgravity, in the absence of externally applied pressure. If it does not, then gravity has no effect on its formation, and instead it results from alterations in the stress gradient experienced by the organism impacted. The second area of progress involves establishing how the biochemical pathway to lignin is regulated, particularly with respect to selective monolignol biosynthesis. This is an important question since individual monomer deposition occurs in a temporally and spatially specific manner. In this regard, the elusive metabolic switch between E-p-coumaryl alcohol and E-coniferyl alcohol synthesis has been detected, the significance of which now needs to be defined at the enzyme and gene level. Switching between monolignol synthesis is important, since it is viewed to be a consequence of different perceptions by plants in the gravitational load experienced, and thus in the control of the type of lignification response. Additional experiments also revealed the rate-limiting processes involved in monolignol synthesis, and suggest that a biological system (involving metabolite concentrations, as well as enzymatic and gene (in)activation processes) is involved, rather than a single rate-limiting step.

Author

*Gravitational Effects; Lignin; Biochemistry; Microgravity; Plants (Botany); Vegetation Growth; Biosynthesis; Gravitropism*

## 52

### AEROSPACE MEDICINE

*Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.*

**19980202544** Air Force Medical Center, Lackland AFB, TX USA

**Effect of the Menstrual Cycle on Maximum Oxygen Consumption and Endothelium-Dependent Vasodilation Final Report, 15 Dec. 1995 - 31 Dec. 1997**

Andrews, Thomas C., Air Force Medical Center, USA; Dec. 1997; 14p; In English

Contract(s)/Grant(s): 96MM6641

Report No.(s): AD-A338769; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Endogenous estradiol and progesterone may have important effects on endothelial function in pre-menopausal women and may thereby influence the time course of atherogenesis. This effect may also correlate with changes in exercise and could influence how women perform during times of stress. We studied endothelium-dependent vasodilation of the brachial artery during three

phases of the menstrual cycle in 20 eumenorrheic subjects to determine the effect of endogenous estradiol and progesterone. The degree of endothelium-dependent, flow-mediated vasodilation was assessed using high resolution brachial artery ultrasound comparing baseline diameter to that obtained during reactive hyperemia. Endothelium-independent vasodilation was similarly assessed by measuring brachial artery diameter after administration of sublingual nitroglycerin. Exercise performance was measured by determining the maximum oxygen consumption and the endurance time on an anaerobic speed test (AST). Serum lipids were measured along with the estradiol and progesterone levels was also determined. Each subject was studied at three phases of the menstrual cycle: early follicular phase when estradiol and progesterone levels are low, at mid-cycle when estradiol levels are elevated and progesterone levels remain low, and during the luteal phase when levels of both hormones are elevated. Compared to the early follicular and luteal phases, flow-mediated vasodilation was greatest at mid-cycle (follicular  $8.0 \pm 1.1\%$ ; mid-cycle  $10.9 \pm 1.4\%$ , luteal  $7.6 \pm 1.1\%$ ,  $p = 0.059$ ). The serum progesterone level was a significant negative correlated of flow-mediated vasodilation ( $R = -0.261$ ,  $p = 0.027$ ). Lipid levels, maximum oxygen consumption and AST times did not change significantly during the three phases of the menstrual cycle.

DTIC

*Oxygen Consumption; Endothelium; Menstruation; Hormones*

**19980202548** Institute for Human Factors TNO, Soesterberg, Netherlands

**Telemedicine: Online Teleconsultancy and Telesurgery Interim Report Telemedicine: Directe Teleconsultatie en Telechirurgie**

Hin, A. J. S., Institute for Human Factors TNO, Netherlands; Daanen, H. A. M., Institute for Human Factors TNO, Netherlands; Lotens, W. A., Institute for Human Factors TNO, Netherlands; Dec. 22, 1997; 46p; In Dutch

Contract(s)/Grant(s): A96/M/355

Report No.(s): TNO-TM-97-A084; TD-97-0484; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 DE Soesterberg, The Netherlands); US Sales Only, Hardcopy, Microfiche

The Royal Netherlands Army has requested to make a study on the recent developments in the area of telemedicine and to give recommendations on the introduction of on-line teleconsulting and telesurgery systems in the military medical organization. In remote areas (by distance or by inaccessibility) on-line teleconsulting can be a convenient solution to bring the appropriate knowledge and experience on the site of accident or operation. Two situations are distinguished in the military forces to introduce a teleconsulting system. A first application is a system carried by medical personnel for triage of victims on the battlefield. A second application is a system for an operating room which allows to consult a remote specialist. The proper characteristics of the video/audio-system, and the implementation of communication procedures between medical man and specialist based on existing military medical protocols need to be investigated further.

Author

*Telemedicine; On-Line Systems; Protocol (Computers); Telecommunication*

**19980202913** Army Construction Engineering Research Lab., Champaign, IL USA

**A Comparative Study of Indoor Human Response to Blast Noise and Sonic Booms Final Report**

Schomer, Paul D., Army Construction Engineering Research Lab., USA; Sias, John W., Army Construction Engineering Research Lab., USA; Maglieri, Domenic, Army Construction Engineering Research Lab., USA; Mar. 1998; 79p; In English

Report No.(s): AD-A341404; CERL-TR-98/25; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

For the past two decades in the USA, blast sounds and sonic booms both have been assessed using C weighted day and night average sound level. Based almost exclusively on blast sound research, a new method which replaces the C weighted day and night average sound level recently has been recommended, reviewed, and incorporated into a new American National Standard. As in the previous method, the new method includes and assesses sonic boom sounds in a like manner to blast sounds. However, while available evidence suggested that in an indoor setting sonic boom could be treated in a similar fashion to blast sounds, experimental evidence was lacking. To provide the lacking comparison data, this study tested the responses of subjects to sonic booms to determine if they were consistent with the previous blast response data presented by Schomer in 1994, since these data formed the basis for the new method. A key factor in the design of this study was the presentation of real blasts and booms to subjects situated in real structures in the field. The new data resulting from this study show good general agreement with the previous data.

DTIC

*Noise; Noise Tolerance; Sonic Booms; Blasts; Human Tolerances*

**19980203088** NASA Langley Research Center, Hampton, VA USA

**Method of and Apparatus for Histological Human Tissue Characterization Using Ultrasound**

Yost, William T., Inventor, NASA Langley Research Center, USA; Cantrell, John H., Inventor, NASA Langley Research Center,

USA; Taler, George A., Inventor, NASA Langley Research Center, USA; May 05, 1998; 10p; In English  
Patent Info.: Filed 26 Jan. 1996; NASA-Case-LAR-15040-1; US-Patent-5,746,209; US-Patent-Appl-SN-592833; No Copyright;  
Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A method and apparatus for determining important histological characteristics of tissue, including a determination of the tissue's health is discussed. Electrical pulses are converted into meaningful numerical representations through the use of Fourier Transforms. These numerical representations are then used to determine important histological characteristics of tissue. This novel invention does not require rectification and thus provides for detailed information from the ultrasonic scan.

Official Gazette of the U.S. Patent and Trademark

*Tissues (Biology); Fourier Transformation; Histology; Ultrasonics; Histochemical Analysis; Electric Pulses; Health*

**19980203141** Army Aeromedical Research Lab., Fort Rucker, AL USA

**Heat Stress Effects of a Navy/USMC vs. Army Aviator Ensemble in a UH-60 Helicopter Simulator Final Report**

Reardon, Matthew J., Army Aeromedical Research Lab., USA; Fraser, E. B., Army Aeromedical Research Lab., USA; Katz, Lawrence, Army Aeromedical Research Lab., USA; LeDuc, Patricia, Army Aeromedical Research Lab., USA; Morovati, Pooria, Army Aeromedical Research Lab., USA; Feb. 1998; 73p; In English

Contract(s)/Grant(s): Proj-3M162787A879

Report No.(s): AD-A341281; USAARL-98-21; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This aviator heat stress study used a between test subjects design with one environmental condition (hot) and two current (U.S. Navy/U.S. Marine Corps vs. U.S. Army) rotary wing MOPP4 ensembles encumbered with additional ballistic protective and over-water survival components. Four U.S. Marine Corps (USMC) aviators (2 UH-60 crews) were tested in the hot condition and their physiological, subjective, and flight performance responses compared to those of 14 Army aviators (9 crews) who tested in the same condition in a previous related study. The environmental condition consisted of 100 F (dry bulb) and 20 percent relative humidity (RH) in an environmental chamber where test subjects walked on a treadmill for 20 minutes to simulate preflight outdoor activities, and 100 F and 50 percent RH (90 F wet bulb globe temperature WBGT) in the UH-60 simulator. Every 30 minutes the right seat pilot encountered instrument meteorological conditions and ascended to 2000 feet to perform a 10 minute set of standard maneuvers. These maneuvers included straight and level (SL), right standard rate turn (RSRT), left climbing turn (LCT), and left descending turn (LDT). After each iteration of the set of standard maneuvers, the pilot returned to nap of the earth (NOE) and contour flight between control points. The right seat pilot also performed up to four 1 minute hovers (HOVs) and hover turns (HOVTs) in the 2 hour sortie and three in the second 2 hour sortie.

DTIC

*Aircraft Pilots; Heat Tolerance; Flight Simulators; Physiological Effects; UH-60A Helicopter*

**19980203165** NASA Langley Research Center, Hampton, VA USA

**Differential Measurement Periodontal Structures Mapping System**

Companion, John A., Inventor, NASA Langley Research Center, USA; May 26, 1998; 15p; In English

Patent Info.: Filed 9 Sep. 1996; NASA-Case-LAR-15282-1; US-Patent-5,755,571; US-Patent-Appl-SN-712984; No Copyright;  
Avail: US Patent and Trademark Office, Hardcopy, Microfiche

This invention relates to a periodontal structure mapping system employing a dental handpiece containing first and second acoustic sensors for locating the Cemento-Enamel Junction (CEJ) and measuring the differential depth between the CEJ and the bottom of the periodontal pocket. Measurements are taken at multiple locations on each tooth of a patient, observed, analyzed by an optical analysis subsystem, and archived by a data storage system for subsequent study and comparison with previous and subsequent measurements. Ultrasonic transducers for the first and second acoustic sensors are contained within the handpiece and in connection with a control computer. Pressurized water is provided for the depth measurement sensor and a linearly movable probe sensor serves as the sensor for the CEJ finder. The linear movement of the CEJ sensor is obtained by a control computer actuated by the probe. In an alternate embodiment, the CEJ probe is an optical fiber sensor with appropriate analysis structure provided therefor.

Official Gazette of the U.S. Patent and Trademark

*Ultrasonic Wave Transducers; Depth Measurement; Dentistry; Acoustics; Surface Acoustic Wave Devices; Signal Detectors*

**19980203190** Georgetown Univ., Washington, DC USA

**Akamai Network for Diagnosis, Treatment and Management to Support Telepresence Annual Report, 31 Aug. 1996 - 30 Aug 1997**

Mun, Seong K., Georgetown Univ., USA; Oct. 1997; 335p; In English

Contract(s)/Grant(s): DAMD17-94-V-4015

Report No.(s): AD-A341638; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

The Akamai Project corresponds with the Joint Science and Technology Plan (JSTP) for Telemedicine, published by the Director, Defense Research and Engineering. A telemedicine needs assessment protocol has been developed to support future programs. Telemedicine capabilities are applied to urgent care, hemodialysis, pathology, radiology, surgery and nuclear medicine. A telemedicine evaluation protocol has been fully implemented. Telemedicine is more than patient care and technology; the potential social impact and questions of data security and patient confidentiality have been assessed. The latter have been studied extensively and a new testing environment is underway. Technologies under development include a multimedia database and a virtual reality application for spine surgery, biopsy and breast palpation. These advanced concepts will play significant roles in telemedicine corresponding to the JSTP statement. As an educational program, teens from DC were trained to develop a home page to educate other teens about the risk of sexually transmitted diseases. Significant progress has been made in segmentation, particularly in developing better edge detection capability, which is fundamental to the success of various imaging projects. \* Advances in chest imaging, especially in image processing, will further improve the quality of images in the telemedicine environment. We are working on telemedicine support for chronically ill patients with diabetes, hypertension and/or kidney disease. Much of this work will be done in collaboration with the USAMRMC and Walter Reed Army Medical Center.

DTIC

*Medical Services; Telemedicine; Image Processing; Clinical Medicine; Television Systems; Diagnosis; Imaging Techniques; Teleoperators; Networks*

## 53

### BEHAVIORAL SCIENCES

*Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.*

**19980202316** Naval Health Research Center, Health Sciences and epidemiology Dept., San Diego, CA USA

**The Mental Status of Women in the Navy and Marine Corps: Preliminary Findings from the 1995 Perceptions of Wellness and Readiness Assessment Final Report, 1995-1996**

Hourani, L. L., Naval Health Research Center, USA; Yuan, H., Naval Health Research Center, USA; Graham, W., Naval Health Research Center, USA; Powers, L., Naval Health Research Center, USA; Simon-Arndt, C., Naval Health Research Center, USA; Appleton, B., Naval Health Research Center, USA; Dec. 1997; 48p; In English

Contract(s)/Grant(s): MIPR-94-KSSM5527

Report No.(s): AD-A339334; NHRC-97-40; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Patterned after the large national health surveys, the 1995 Perceptions of Wellness and Readiness Assessment was designed to provide baseline health and risk factor information on the health and mental health status of women in the US Navy and Marine Corps. A population-based, two-stage, cluster sample of nearly 10,000 active-duty Navy and Marine Corps women and men were screened for above-normal levels of psychosocial distress and depressive symptomatology using standard cut-points on two psychiatric screening instruments. A clinically based, structured computerized telephone interview was administered to sub samples of both positive-and negative-screening volunteers to make Diagnostic Statistical Manual-III-R psychiatric diagnoses.

DTIC

*Females; Navy; Mental Health; Psychological Factors*

**19980202654** Smith-Kettlewell Inst. of Visual Sciences, Eye Research, San Francisco, CA USA

**Visual Processing of Object Velocity and Acceleration Final Report, 1 Apr. 1995 - 31 Dec. 1997**

McKee, Suzanne P., Smith-Kettlewell Inst. of Visual Sciences, USA; Mar. 27, 1998; 13p; In English

Contract(s)/Grant(s): F49620-95-1-0265; AF Proj. 2313

Report No.(s): AD-A341070; AFRL-SR-BL-TR-98-0299; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research analyzed human detection of object motion in random motion noise. Results from experiments demonstrated that: (1) a flexible neural network enhances detection of a feature moving in a constant direction or changing direction slowly; (2) the network uses a highly non-linear facilitation, rather than the linear sum of contrast or luminance signals; (3) a stimulus pattern that moves along the motion path is more detectable than one oriented orthogonal to it; (4) stereopsis does not provide much benefit for detecting motion signals in noise; (5) motion along the z-axis (motion in depth) can be masked by static disparity noise; and (6) the motion system can simultaneously encode both the local directions of small features and the global direction of the flow field. A Bayesian model of object motion and surface segmentation is being developed to explain these observations.

Future work will explore whether this model of human motion processing can be implemented computationally in VLSI hardware for detecting moving projectiles in the midst of noise.

DTIC

*Visual Perception; Visual Signals; Velocity; Acceleration; Detection; Random Noise; Trajectories*

**19980202744** Institute for Human Factors TNO, Soesterberg, Netherlands

**The Influence of Expectation on the Perception of Linear Horizontal Motion** *Interim Report De Invloed van Verwachting op de Waarneming van Lineaire Horizontale Beweging*

Mesland, B. S., Institute for Human Factors TNO, Netherlands; Bles, W., Institute for Human Factors TNO, Netherlands; Wertheim, A. H., Institute for Human Factors TNO, Netherlands; Groen, E. L., Institute for Human Factors TNO, Netherlands; Mar. 23, 1998; 23p; In English

Contract(s)/Grant(s): A92/KLu/331; Proj. 789.3

Report No.(s): TD98-0016; TM-98-A010; Copyright; Avail: Issuing Activity (TNO Human Factors Inst., Kampweg 5, 3769 De Soesterberg, The Netherlands); US Sales Only, Hardcopy, Microfiche

In normal situations the judgment of linear horizontal self-motion largely depends on visual information. In the absence of adequate visual feedback, however, the information provided the otolith organs and non-vestibular proprioceptors (together called linear proprioceptive sensors) becomes more important. The peculiar thing about these sensors is that they respond to linear accelerations, which may arise from transitory motion as well as from the gravitational acceleration. As a consequence it is difficult for these sensors to differentiate between linear translations and tilt with respect to gravity. This ambiguity may lead to the false perception of tilt during pure linear accelerations along a horizontal path. Still, it was our experience that these illusory perceptions only seldomly occur when we oscillate subjects to and fro on a linear track (the ESA-sled). It was hypothesized that prior knowledge of subjects, who had seen the linear motion device before the experiment, may have biased the perception towards a veridical sensation of linear self-motion as opposed to an illusory sensation of self-tilt. In other words, their expectation may have influenced their perception of the stimulus. Therefore, two experiments were carried out in which this cognitive factor was controlled as an independent variable. In the first experiment, blindfolded subjects who were completely naive regarding the characteristics of the motion device were exposed to oscillatory linear motion at frequencies of 0.159 and 0.252 Hz. In the second experiment similar linear motion was applied, but this time in combination with various angles of actual tilt of the subject's seat. The subjects in this experiment were informed beforehand that they would be exposed to various combinations of linear motion and tilt, so that they-although not completely naive-could not have any expectation about whether to perceive tilt or translation. In both experiments the dependent variable was the report about experienced self-motion or self-tilt. The results of both experiments unambiguously confirm that illusory self-tilt is sensed much more frequently when the subject has no precise expectation about the linear motion. Expressed in another way, the expectation of subjects who have seen the sled beforehand seems to enhance the threshold for perceiving self-tilt. It is concluded that expectation from prior knowledge and previous experience should be taken into account when modelling the perception of self-motion. The experiments described in this report clearly demonstrate that the expectation, or mental state, of a subject has significant bearing on the judgment of linear horizontal self-motion. Clearly, the interpretation of sensory information about self-motion depends on more than the transfer characteristics of the peripheral senses alone. As a consequence, one has to take cognitive factors, such as prior knowledge or previous experience, into account when investigating or modelling the perception of self-motion. From this point of view it will be difficult to exactly predict or reconstruct the sensations of an aviator on the basis of the physical characteristics of a flight path. Seen from the positive side, the expectation of an experienced pilot is likely to be advantageous for the appreciation of simulated motion in a flight simulator.

Author

*Motion Simulators; Horizontal Orientation; Cognition; Expectation; Flight Simulators; Visual Perception*

**19980202907** Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

**The Effect of Stereoscopic and Wide Field of View Conditions on Teleoperator Performance** *Final Report*

Scribner, David R., Army Research Lab., USA; Gombash, James W., Army Research Lab., USA; Mar. 1998; 40p; In English

Contract(s)/Grant(s): Proj-1L162716AH70

Report No.(s): AD-A341218; ARL-TR-1598; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study was performed to examine the effects of stereovision and wide Field of View (FOV) and their possible interaction with teleoperator performance. The study used a 2 x 2 (narrow versus wide FOV and mono versus stereo vision) randomized between-subjects design. There were 24 subjects in all, 6 per cell, in conditions of monoscopic-narrow FOV, monoscopic-wide FOV, stereoscopic-narrow FOV, and stereoscopic-wide FOV. No significant interaction effects were found for time or error rate measures. However, ANALYSES OF VARIANCE (ANOVAs) yielded significant differences between mono and stereo vision for error rate (number of obstacles contacted) as well as reported motion sickness symptoms on the FOV dimension. Self-reported stress

levels from pre- to post-run also yielded significant differences on the mono-stereo dimension. Chi-square analyses were performed on questionnaire data for condition preferences. A first chi-square analysis revealed significant findings of first choice of viewing condition, which was stereoscopic-wide FOV. Additionally, a second chi-square analysis of unique viewing conditions showed a significant effect of stereovision; it was the single most preferred viewing condition of all four.

DTIC

*Teleoperators; Field of View; Stereoscopic Vision; Display Devices*

**19980203133** Metrica, Inc., San Antonio, TX USA

**Evaluating the Decision Making Skills of General Aviation Pilots**

Driskill, Walter E., Metrica, Inc., USA; Weissmuller, Johnny J., Metrica, Inc., USA; Quebe, John C., Metrica, Inc., USA; Hand, Darryl K., Metrica, Inc., USA; Feb. 1998; 43p; In English

Report No.(s): AD-A341118; DOT/FAA/AM-98/7; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An instrument consisting of 51 items was developed to assess pilot decision-making skill. Each item consisted of a stem, a short description of an aviation scenario requiring a decision on the part of the pilot. Four alternatives were provided, and subjects were instructed to rank order the alternatives from best to worst solution to the scenario presented. Rank-ordered judgments of a sample of 246 general aviation (GA) pilots (with an average of about 500 hours of total flying experience) were compared with the recommended solutions provided by an expert panel. Results indicated that, overall, GA pilots and an expert panel of pilots agreed in their judgments of the appropriate course of action in situations critical to flight safety. However, the degree of agreement of individual general aviation pilots with the recommended solutions varied widely. An index of agreement (Safety Deviation Index) was calculated that expressed the degree of agreement of individual GA pilots with the recommended solutions. Initial evaluation of this index indicates that it demonstrates adequate psychometric properties and that, as other research would suggest, it has little relationship with common demographic or flight experience measures.

DTIC

*Decision Making; Aircraft Pilots; Pilot Performance*

**54**

**MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT**

*Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.*

**19980202599** Federal Aviation Administration, Technical Center, Atlantic City, NJ USA

**Human Factors Evaluation of Vocoders for Air Traffic Control Environments, Phase 2, ATC Simulation**

Sollenberger, Randy L., Federal Aviation Administration, USA; LaDue, James, Federal Aviation Administration, USA; Carver, Brian, Federal Aviation Administration, USA; Heinze, Annmarie, Federal Aviation Administration, USA; Dec. 1997; 48p; In English

Contract(s)/Grant(s): DTFA03-94-C-00042

Report No.(s): AD-A341106; DOT/FAA/CT-TN97/25; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Vocoders offer a potential solution to radio congestion by digitizing human speech and compressing the signal to achieve low bandwidth voice transmissions. A reduction in bandwidth will allow the addition of more communication channels to the system and reduce radio congestion. This air traffic control simulation study is the second phase of a research effort to compare the effectiveness of two 4.8 kbps vocoders (designated as A and B for test purposes) with the current analog radio communication system. Sixteen air traffic controllers from Level 5 Terminal Radar Approach Controls participated in the study and performed 12 one hour traffic scenarios over 3 days of testing. Scenarios consisted of medium and high traffic volumes designed to produce different levels of controller taskload. The communications configuration allowed each simulation pilot to transmit with jet, propeller, or helicopter background noises. The results indicated that the vocoders did not affect controller workload or performance. In general, intelligibility and acceptability ratings were highest for analog radio, slightly lower for vocoder B, and lowest for vocoder A. In addition, intelligibility and acceptability ratings were highest for jet background noise, slightly lower for propeller background noise, and lowest for helicopter background noise. Controller taskload had no effect on intelligibility and acceptability. This human factors evaluation indicated that both vocoders were highly intelligible and acceptable for air traffic control environ-

ments. Even the least preferred vocoder did not substantially interfere with controller performance. This study suggests that vocoder technology could replace the current analog radio system in the future.

DTIC

*Environments; Human Factors Engineering; Vocoders; Air Traffic Control; Air Traffic Controllers (Personnel); Control Simulation; Radio Communication; Jet Aircraft Noise; Voice Communication*

**19980202667** Institute for Human Factors TNO, Soesterberg, Netherlands

**Effects of Head-Slaved and Peripheral Displays on Lane-Keeping Performance and Spatial Orientation** *Interim Report*  
*Effecten van hoofd-gestuurde en perifere displays op stuurprestatie en ruimte-liijke orientatie*

Kappe, B., Institute for Human Factors TNO, Netherlands; Korteling, J. E., Institute for Human Factors TNO, Netherlands; van Erp, J. B. F., Institute for Human Factors TNO, Netherlands; Nov. 24, 1997; 29p; In English

Contract(s)/Grant(s): A95/KL/306

Report No.(s): TNO-TM-97-A-72; TD-97-057; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 DE Soesterberg, The Netherlands); US Sales Only, Hardcopy, Microfiche

The images presented in low-cost vehicle simulators and in operator interfaces of Remotely Piloted Vehicles (RPVS) often do not provide enough information for optimal vehicle control and do not elicit sufficient spatial orientation. To improve the effectiveness of these images, the virtual viewing direction can be 'head-slaved', or the display can be surrounded with a less detailed peripheral image. Three simulator experiments were used to evaluate the effect of these techniques on steering performance and spatial orientation. In Experiment 1, vehicle references or a head-slaved display provided feedback on the virtual viewing direction. Vehicle references brought about some improvement in lane-keeping performance when a standard 500 x 500 (h x v) display was used. A head-slaved display (501 x 501) allowed better steering performance, but not up to the levels obtained with a traditional three-channel display (1501 x 501). Experiments 2 and 3 addressed the effects of surrounding the head-slaved display with a less detailed peripheral image, and of moving the head-slaved display discretely or continuously. With the peripheral image (surrounding a head-slaved display), lane-keeping performance (Experiment 2) and spatial orientation (Experiment 3) were just as good as they were with a traditional three-channel display. Performance with the discretely moving head-slaved display was superior to the performance with the more sophisticated continuously moving display. The results show that low-cost simulators and RPV operator interfaces can be equipped with an efficient low-cost display that is just as effective as a normal multi-channel display.

Author

*Remotely Piloted Vehicles; Optimal Control; Low Cost; Display Devices; Attitude (Inclination)*

**19980202892** Defence and Civil Inst. of Environmental Medicine, North York, Ontario Canada

**Layered Protocol Analysis of a Control Display Unit**

Farrell, Philip S. E., Defence and Civil Inst. of Environmental Medicine, Canada; Semprie, Marc A. H., Defence and Civil Inst. of Environmental Medicine, Canada; Dec. 1997; 79p; In English

Report No.(s): AD-A341702; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Layered Protocol Theory (LPT) has been described as a special case of Perceptual Control Theory (PCT) where its core tenet is, All communication is the control of belief. It was recognized that LPT could be used to analyse the interaction between communicating partners in the context of human-machine systems. System interface problems were identified for the Control Display Unit (CDU) in the CH-146 Griffon helicopter. This application presented a good opportunity to conduct a Layered Protocol analysis on the pilot CDU system. Aspects of LPT were discussed in detail including the LPTool, its Network View, GPG View, and Nine Element View. A pilot CDU interaction was modeled with the aid of the LPTool program. The analysis yielded a list of interaction deficiencies between pilot and CDU which supported previous observations. The deficiencies were addressed in a new interface design that would provide the necessary controls and displays so that the required messages could be successfully transmitted and interpreted.

DTIC

*Man Machine Systems; Control Equipment; Control Theory; Protocol (Computers); Control Units (Computers); Display Devices; Human Factors Engineering*

**19980203086** NASA Ames Research Center, Moffett Field, CA USA

**Suitlock Docking Mechanism**

Culbertson, Philip, Jr., Inventor, NASA Ames Research Center, USA; Dec. 16, 1997; 21p; In English

Patent Info.: Filed 30 Sep. 1996; NASA-Case-ARC-14102-1-LE; US-Patent-5,697,108; US-Patent-Appl-SN-730917; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

An environmental protective suit used for hazardous clean-up or space applications includes a suitlock docking mechanism that allows for easy egress and ingress of a crew member between a sealed vessel and a possibly contaminated environment. The suitlock docking mechanism comprises a single actuator that controls latches which, in turn, respectfully control rack and pinion assemblies that allow for easy removal and attachment of a life support equipment enclosure shell to the environmental protective suit or to the vehicle from which the operator performs his/her duties.

Official Gazette of the U.S. Patent and Trademark

*Protective Clothing; Mechanical Devices; Locking; Egress; Air Locks*

**19980203092** Auburn Univ., AL USA

**Prospector IX: Human Powered Systems Technologies Final Report, 1 Jul. 1997- 30 Jun. 1998**

Rose, Millard F., Auburn Univ., USA; Apr. 1998; 440p; In English; 9th, 2-5 Nov. 1997, Durham, NC, USA

Contract(s)/Grant(s): DAAG55-97-1-0336

Report No.(s): AD-A344414; ARO-37537.1-LS-CF; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

Recent advances in the technologies relevant to harvesting human power, as presented at the workshop, suggest that unobtrusive systems might be built in the range from microwatts to a few watts. As the Army becomes more mobile, a premium is to be paid for capability, reliability, autonomy and minimal mass systems. The frontline soldier, more often than not, does not have access to energy for recharging his power sources and therefore, must carry all his required power sources to complete his mission. The ability to harvest human energy, if favorable in terms of reliability, size, weight, and energy efficiency might translate immediately into increased autonomy time, increased capability, reduce or eliminate certain logistics items, and, perhaps, reduced cost. Fieldable technology rarely equals laboratory prototype or theoretical capability. Obstacles sometimes are fundamental and perhaps can be finessed through appropriate R&D, innovative techniques, and skillful engineering. This workshop attempted to explore some of the possibilities. As confirmed by the plenary speakers and the working groups, there are a number of potential applications where harvesting of human energy could be applied. Typical are: (1) Personal battery chargers, (2) Medical sensors, (3) Display power sources, (4) Gun sight power, and (5) Rangefinder.

DTIC

*Energy Conversion; Human Body; Man Machine Systems; Electric Power; Production*

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